

10. a) Explain window technique for designing FIR digital filter.
- b) Explain mapping of a analog filter from S-plane to digital filter in Z plane using Bilinear transformation. Also investigate the characteristics of the Bilinear transformation.

Roll No

EC-603**B.E. VI Semester**

Examination, December 2014

Digital Signal Processing**Time : Three Hours****Maximum Marks : 70**

- Note:** i) Attempt one question from each unit.
ii) All questions carry equal marks.

Unit - I

1. a) What are discrete time signals and systems? What do you mean by linearity and time invariance of these systems?
- b) Define and explain causal and non causal discrete time LTI system. How can the condition of causality be translated to a condition on impulse response? Derive the condition.

OR

2. a) Derive the equation for the convolution sum as applicable to DTLTI systems.
- b) Compute the convolution $y(n)$ of the signals

$$x(n) = \begin{cases} \alpha^n, & -3 \leq n \leq 5 \\ 0, & \text{else where} \end{cases}$$

$$h(n) = \begin{cases} 1, & 0 \leq n \leq 4 \\ 0, & \text{else where} \end{cases}$$

Unit - II

3. a) Prove the properties of time shifting and time reversal as applicable to Z-transform.
- b) Find the Z-transform of the following:
- $n^2 e^{-2n}$
 - $na^n u(n)$

OR

4. a) Using long division method find inverse of Z-transform of $X(z) = \frac{1+2z^{-1}}{1-2z^{-1}+z^{-2}}$
- If i) $x(n)$ is causal and
ii) $x(n)$ is anti causal.

- b) Compute the convolution $x(n)$ of the signals using Z-transform

$$x_1(n) = \{1, -2, 1\}$$

$$x_2(n) = \begin{cases} 1, & 0 \leq n \leq 5 \\ 0, & \text{elsewhere} \end{cases}$$

Unit - III

5. a) State and prove the following properties of DFT.
- Even and odd properties.
 - Circular frequency shift.
- b) Show that multiplication of two DFT's is circular convolution in time domain.

OR

6. a) How DFT can be used to perform high speed convolution? Explain giving example.
- b) Define DFT of a given time sequence $x(n)$ and hence write five different properties of DFT by giving suitable illustrations.

Unit - IV

7. a) Discuss radix of FFT algorithm. Find the number of computations required for 1024 point DFT using normal method.
- b) Draw the flow graph for decimation in time FFT algorithm for $N=8$, using radix 2. Show various steps of decimation.

OR

8. a) Discuss decimation in time algorithm for FFT and how it differs from the decimation in frequency algorithm.
- b) Draw and explain the flow graph for decimation in frequency FFT algorithm for $N=8$ show various stages of decimation.

Unit - V

9. a) What are the desirable and undesirable features of FIR filters? Differentiate between FIR filters and IIR filters.
- b) Discuss Bilinear transformation method for designing digital filters.

OR